CARBON EMISSION AWARENESS AND INFORMATION PLATFORM

By

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Abstract

Climate change due to global warming has become a worldwide concern. Nowadays, people are starting to wake up and realize that changes need to be made in their lifestyles in order to preserve this earth and provide a better planet for future generations. Finding a concrete solution to global warming and climate change has proven to be a very challenging task. Governments have tried implementing solutions and as a result, corporations have been forced to absorb or transfer the cost of unsuccessful environmental regulations. Meanwhile, individuals remain frustrated, wishing they could find a way to help.

The motivation behind this project was to find to ways were individual consumers and industry could connect and together build the path towards sustainability. The brainstorming process started with the focus on carbon emissions, and the damage they create in the atmosphere and how there are some alternatives that can be used to reduce and eventually mitigate the carbon footprint. Through the brainstorming process the team realized that the internet was a very useful tool, not only to gather information and spread awareness on the idea behind carbon neutrality, but also connect consumers and industry interested in such idea.

After the brainstorming process the team came up with the specific purpose of creating a website that will connect consumers interested in carbon neutral products and companies that offer carbon neutral products or are interested in the subject. The website will serve as an information platform for consumers and industry on carbon offset projects, carbon credits and the overall idea of a carbon neutral product or service.

Throughout the project the team researched on topics related to carbon neutrality and also on how to build a website, and which platform to use. The design step used the DMAIC process to develop the website according to the goals set for the project. The project also involves an economic analysis on the cost and possible revenue from advertisement and other features of the website.

Through the project the team successfully developed the website, and planned the next 12 months of the website to ensure that it is economically feasible. The domain for the website is “www.carbonneutralplatform.com”.

Introduction

Global warming, the observed increase in average temperatures of the Earth's atmosphere and oceans, has become a worldwide concern. It has an impact on every human being on the planet, and, unless addressed effectively, it will have severe consequences in our way of life.

Finding a solution to global warming has proven to be a very challenging task. Governments have tried implementing solutions and as a result, corporations have been forced to absorb or transfer the cost of unsuccessful environmental regulations. Meanwhile, individual consumers remain frustrated, wishing they could find a way to help the environment.

Scientists have found a direct relationship between carbon emission and global warming. Carbon emissions are the primary greenhouse gas emitted into the atmosphere by human activities. Although carbon dioxide is naturally present in the atmosphere, human activities are altering the carbon cycle which is the natural circulation of carbon across the atmosphere, oceans, soil and plants by adding more carbon into the atmosphere and influencing the ability of natural sinks like forests to remove CO2 from the atmosphere.

Every product you buy, every service that you contract, every transaction you may think of, may be a carbon dioxide emissions-free product, service or transaction. Even products you have bought in the past and continue to use can be made carbon dioxide emissions-free or carbon neutral. How is this possible? "Carbon neutral refers to achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset, or buying enough carbon credits to make up the difference"(Go-Green)

Problem Statement

Carbon concentrations in the atmosphere are responsible for problems with human and environmental health, the destruction of ecosystems and our current biggest threat of climate change. Many people are aware of the problems we face regarding the carbon levels in the atmosphere but consumers and industry are often not on the same page. Consumers who are aware and want to reduce their carbon footprint struggle to find ways and options to do so.

Purpose

The purpose of this project is to develop a website that will connect consumers

interested in carbon neutral products and companies that offer carbon neutral products or are interested in the subject. The website will serve as an information platform for consumers and industry on carbon offset projects, carbon credits and the overall idea of a carbon neutral product or service.

The information platform will include the following:

- Section dedicated to companies that offer carbon neutral products so consumers can search for specific categories and price ranges for different products.
    - This section will allow the consumer to compare products and get information about the environmental impact of the specific product.
    - Will link consumer to companies that offer environmentally friendly products of their interest.
- Section including companies leading the Dow Jones sustainability index to inform consumers and other companies.
- Section including general updated information on carbon emissions, carbon credits and environmentally friendly projects. This section will inform both industry as well as consumers.
- Section with data and statistical analysis on consumer input and expectations for carbon neutral products to inform industry about potential marketability and profitability.
- Option for consumer to create username with email and subscribe to website to receive emails with updated information as well as carbon neutral products offered by companies advertised in website
- Section with information dedicated to individuals on how to reduce their overall carbon footprint based according to their daily activities
- Depending on website success, inform industry about products consumers are searching on website and overall tendencies.

Background

Since the Industrial revolution changes in human lifestyle have led to unprecedented Carbon concentration levels in the atmosphere. This has become a worldwide concern under discussion by scientists and governments. It has impacts on every human being on the planet and, unless addressed effectively the carbon levels in the atmosphere that drive global warming will continue to increase and will have severe consequences on our way of life. If people around the world do not act to control global warming, scientists have predicted that by 2100:

- There will be a rise in the Earth's temperature (between 1.4ºC and 5.8ºC).
- Sea levels will be higher as glaciers melt and oceans expand (up to 88 cm).
- Changes in weather patterns will affect life on the planet.
- Stronger and more frequent weather-related natural disasters, such as droughts, floods and hurricanes, will be experienced all around the world.

It is the prevailing scientific opinion that "most of the warming observed over the last 50 years is attributable to human activities"(IPCC). Carbon dioxide emissions are the primary cause of the human-induced component of warming. Almost every human activity requiring the use of energy will produce carbon dioxide, as it is released into the atmosphere when fossil fuels are burned. "The average American generates about 20 tons of carbon dioxide every year through personal transportation, home energy use, and from the energy used to produce all the products and services we consume"(Green Contributor). This means that each and every one of us is responsible for global warming. Although the data suggests that human activities have caused most of the damage in the atmosphere that has led to global warming and climate change, scientists believe that if we all improve our footprints by lowering our CO2 emissions, we could slow down global warming and prevent its damaging effects.

Literature Review

Carbon Footprint

What is exactly carbon footprint? "It is a measure of the amount of carbon dioxide, or CO2, emitted through the combustion of fossil fuels - oil, gas and coal"(Graham-Rowe) The carbon footprint for an individual represents the how much of CO2 being emitted into the atmosphere is your personal responsibility from your day to day activities like travelling to work, using your computer, boiling a cup of tea, going out in the evening, etc. The carbon footprint for an individual not only depends on daily activities, it also depends on the companies and products the individual chooses to relate with. Some companies have carbon reduction initiatives, which mean their products will have a smaller carbon footprint.

Reducing carbon dioxide emissions - Individuals

Most of the time, reducing carbon emissions and saving money go hand in hand. There are a lot of simple ways to reduce carbon emissions. For example, "5 We each contribute about 1.5 tons of carbon a year heating our homes. Turn down the thermostat by two degrees - every extra degree accounts for 25kg of CO2 each

year” (Gardner). Replacing an old furnace with an Energy Star furnace can save 3000 pounds of CO2 emissions, but also save $370 in heating costs (Gardner). Reducing human-induced carbon dioxide emissions:

- Finding clean and renewable energy sources to replace fossil fuels. Scientific research has provided clean energy sources. However, we are still far away from being able to replace fossil fuels as our primary source of energy.
- Changing human lifestyles, in order to reduce the carbon dioxide emissions generated by common daily activities. Individual efforts in this regard are useful, but it would be unrealistic to believe that a significant percentage of emissions can be reduced through lifestyle changes.

Reducing carbon emissions - Companies

Although individual efforts can certainly be helpful to reduce the overall carbon footprint and slow the impact of global warming and climate change, there needs to be more decisive actions taken. If companies decide to get involved in reducing carbon emissions not only are they helping the world, but they are making their business stronger.

Reducing carbon emissions can lead to reduction in costs for companies. “For many businesses, the easiest way to cut emissions of greenhouse gases is to cut their use of energy, which conveniently also cuts costs”(Mathieson). Dr Garry Felgate, a director of the government- funded Carbon Trust “companies can cut energy use by 30%, with 10 to 15% through little or no spending”(Mathieson).

Reducing carbon emissions can not only save money, but also attract new business. A successful company in the world today is profitable, socially responsible and conscious with the environment. Reducing carbon emission can improve a company's marketability to clients concerned on reducing carbon footprint and it can be the deciding factor in why the customer chooses to pay for the product or service. Most of the time Individuals who are concerned about reducing their carbon footprint, struggle to find products that have lowered carbon emissions in their process or through the lifetime. Offering carbon emission reduced product is an alternative where a company can differentiate their product or service from their competition, and become more marketable to different customer segments.

Carbon Offsets

Carbon Offsets are “alternative or supplementary ways for individuals, organizations, and governments to reduce emissions from their own households, operations, or

countries" (Bumpus) .The idea behind carbon offsets is that "paying for CO2 reductions elsewhere is easier, cheaper, and faster than domestic reductions, providing greater benefits to the atmosphere and to sustainable development, especially when offsets involve projects in the developing world" (Bumpus).

Carbon Credits

"Individuals and organizations can compensate for their greenhouse gas emissions by purchasing carbon credits that are generated by emission-reduction projects elsewhere" (Bumpus). The emission reduction projects include: forest planting, renewable energy, biofuels, methane capture. Carbon credits can be purchased by industry, governments or even private individuals. It is the way to offset carbon emissions because the amount of credits purchased will compensate and offset for the amount desired.

Carbon sequestering

Carbon sequestering is defined as the long-term storage of carbon in the soil and in living and dead vegetation and can serve as a way to offset carbon dioxide emission(Union of Concerned Scientists). Carbon sequestration can be direct or indirect.

- Direct Sequestration: involves capturing carbon dioxide at its point of generation, before it is released into the atmosphere. For example, removing carbon dioxide from the exhaust streams of factories and electric plants and storing it in deep subsoil (Coal Utilization Technologies).
- Indirect Sequestration: involves capturing carbon dioxide already released into the atmosphere. It is removed from the atmosphere through intake by plants or by fixing carbon in the soil.

Triple Bottom Line (TBL)

It is an accounting framework developed by John Elkington to measure performance in corporate America that incorporates three dimensions of performance: social, environmental and financial or 3P's (People, Planet, Profit). This method differs from traditional reporting frameworks as it includes ecological and social measures that can be difficult to assign appropriate means of measurement as mentioned in the article "the trick isn't defining TBL, the trick is measuring it."(Slaper)

The 3Ps do not have a common unit of measure so it's hard to calculate TBL, some suggestions that have been given is to calculate it in terms of an index. However many questions arise when proposing an index, do all P's get equal weighting? What about sub-components within each "P"? With all the many questions that arise when proposing and index, it has made it hard to accept a standard for measuring TBL. But this can be viewed as strength because it allows a user to adapt the general framework to the needs of different entities, projects, policies, or geographic boundaries. (Slaper)

TBL has seen an increase in business, nonprofits and government entities. Even though there is not a defined index each entity uses, many principles have been incorporated to their business models. "Companies recognize that aligning with nonprofit organizations makes good business sense, particularly those nonprofits with goals of economic prosperity, social well-being and environmental protection." The flexibility of TBL allows organizations to apply the concept in a manner suitable to their specific need. (Slaper)

CO2 Emissions and Taxes

It has been proposed to introduce a carbon-based tax that will help reduce CO2 emissions and create a path to limit atmospheric concentrations to levels considered safe for global climate. With a study done by Dr. Shapiro and colleagues it was found that results can be achieved by applying a charge of up to $50 per-ton of CO2 and returning 90 percent of revenues and tax relief for the people and business using the energy and paying the tax.

Dr. Shapiro said "Climate change is a critical issue that warrants a serious solution. Implementing the wrong policy could ultimately be as damaging as doing nothing." The analysis found that a carbon-based tax would reduce U.S. carbon dioxide emissions consistent with a long term path to safe levels would entail a charge rising from $14 per-ton of CO2 in 2010 to $50 in in 2030. The charge would create direct incentives for business and households to prefer less carbon-intensive fuels, use less energy-intensive technologies and products. The simulation in the study show that the proposed tax will generate $4 trillion in revenue over 20 years, of which nearly $3.6 trillion would be returned to households in payroll tax cuts or their equivalent. The study found that by 2030, this strategy would drive down U.S. CO2 emissions by about 30 percent.

Carbon Capture and Storage

The long-term solution of reducing greenhouse gas emissions is to uncouple energy use and CO2 release. But it is unlikely that in the near future the alternate energy sources and technologies can fully substitute fossil fuels. Therefore carbon capture and storage (CCS) is being investigated as a mitigation measure for carbon dioxide emissions and climate change. Some options available for mitigation of climate change include improved fuel economy, more efficient buildings, decarburization of electricity and fuels, substitution of natural gas for coal among other options. (Gurjar)

Literature Review Summary

The information collected throughout this literature review will serve as the basis for the project. Some of the information collected will actually be displayed on the information platform for consumers and industry to read. The literature review also confirmed the assumption that at this point in time there is nothing currently linking consumers and industry interested in carbon neutral products and environmentally friendly projects. The information collected will help maintain the cope throughout the whole project and hopefully guide to successfully achieving goals. Topics like triple bottom line will guide consumers (people) purchasing products from companies (profit) and at the same time include (planet) with the idea of carbon neutral and environmentally friendly products.

Design

For this project the team used the DMAIC process in order to successfully complete the project and fulfill the goals set at the beginning. Following the DMAIC process enabled the team to be consistent with the overall design. The DMAIC process consists of 5 steps: Define Measure, Analyze, Improve and Control.

The Define step is where the team defined the project goals and the requirements. In this phase, the team decided to create an information platform to inform consumers and industry about carbon neutral projects and products, and also to connect consumers and industry interested in sustainability. In the Measure phase the team brainstormed on the specifics of the information platform, researched different methods of creating a website and also defined the sections that the website will include and their respective purpose. In the Analyze phase, the team determined the content of each section of the website; in this phase the team also built the website. The improve phase consisted of meetings with the academic advisor to find out ways to improve the website and alternatives to the overall design and layout of the website. To find out how to make it more ergonomic as well as to better address the needs and meet the goals and requirements set on the define step. The last step of

the DMAIC process (control) consisted in setting the plan to maintain the website after the project is done.

Define:

The motivation behind creating the information platform is to improve the quality of life of we live today, but most importantly to improve the living conditions for future generations. The platform will include the 3 “P” which are people, planet and profit.

With the people there will be two main objectives which will be to increase awareness on the carbon neutral topic through information, and also connect consumers and industry interested on carbon neutral projects, products, services and sustainability. Increasing customer and industry awareness on carbon neutral alternatives is the first step towards a more sustainable future because people need to be aware of the negative effects carbon emissions have in the atmosphere. Increasing awareness will also make consumers realize that there are environmentally friendly alternatives to the products and services they buy every day and will make industry realize that there is a very big market for environmentally friendly products and having carbon neutral options in their products can increase sales and at the same time reduce costs. The platform will also connect industry with the companies that offer carbon credits and companies that can help them become carbon neutral.

For the profit, the website will generate revenue through advertisement and also through a fee that can be charged to include a company's products and services in the website. The information platform will be nonprofit, so the revenue from the website will be dedicated to cover the website’s maintenance costs and then profit will be dedicated to funding research projects on any topic related to sustainability.

The economic analysis on the results section will expand more on the profit part of the information platform. For the planet part the goal is to help reduce the carbon footprint in the atmosphere by encouraging consumers and industry to invest in the topic of carbon neutrality and realizing that small changes in their lifestyle or operating procedure can lead to enormous changes in their carbon footprint.

Measure:

After defining clear goals for the information platform, the team proceeded to research on different alternatives on which software would be the best option to build the website. The first option was amazon’s web services or AWS. AWS is a cloud-

based service that enables members to build web applications using cloud computing and also provides startup guides and videos that help when building the desired web application. The team investigated about Amazon AWS but the cost to benefit ratio was not in line with the goals for the project and the website. AWS was too expensive for the start of the project and there was no significant benefit that would justify paying for the service. The team then proceeded to search for more alternatives including using Microsoft Visual Studio, SquareSpace, Wix and WordPress. After carefully analyzing each alternative, WordPress was the final choice.

WordPress allows the website developers to pay for services depending on the views and clicks received which is ideal for the goals and objectives the team set for the duration of the project. It also has great reputation and reliability, providing a platform for companies like BBC America, Best Buy and Forbes. WordPress also has a user friendly dashboard with buttons and tabs for customizing the website and building the application to meet the team's goals and connect with the end user.

After deciding that WordPress was the appropriate platform to build and host the website, the next step was to get a domain name. The team brainstormed many ideas, but in the end it was decided to go with "www.carbonneutralplatform.com" this name was closely related to the objective, it was easy to remember and it was available.

The next step was to develop an outline in order to organize the content taking into consideration the goals for the website and also the needs of its future users. First, the team brainstormed ideas on different sections that the website needed to have and also different alternatives for the organization, title and overall message for the platform. Then the team gathered the best ideas and topics from the brainstorming process and constructed the outline.

Developing the website outline was a critical step in achieving the goal of building the website. The outline not only provided the guidance through the building process, but also helped narrow the scope for the information platform and focus on the key aspects that directly impacted the progress and end goal of the website. The outline was then converted into a flowchart, this was a great visual representation to identify the relationships between each section and sub tabs. The website and outline and respective flowchart are attached on the end of the report in the appendix section.

On the measure phase, the team also researched on different sources of information for the website and identified which of those were reliable. The team also proceeded to look at websites with topics related to sustainability and carbon neutrality.

Analyze:

The analyze stage was the most time consuming and challenging part of the project, but it was also the most rewarding. This is the stage of the project were the team built the actual information platform. The first step was to find the online tutorials in order to build the best possible website. This was a long process of getting to know how WordPress works and learning about available features and alternatives that could be used to develop and layout the website. This is a process of continuous improvement as the team keeps learning more information everyday about how to improve the website through feedback from users. The team constructed a pilot test website in order to practice and try different layout alternatives to see which one would best meet the requirements and goals set on the define stage of the DMAIC process.

After getting a good understanding of how WordPress works through tutorials and trial and error in the pilot test, the team proceeded to create the pages for all the sections, and sub tabs of the information platform. The pages were left blank at this point, because the website needed to have a complete structure before the content was added. Using the flowchart that was developed in the measure stage, the next step was to create the buttons and links that would guide the user while navigating through the website and also give the structure to the information platform. The flowchart and the lessons learned in the pilot test provided very good feedback and direction on the different sections of the website, the team spent a lot time designing and creating each section.

Improve:

After the team built all the sections, created the connections for navigating through the information platform and added content to each section; the team met with the academic advisor to make revisions and improve the website. This step provided guidance, and the changes were mostly directed towards the layout and navigation through the website to make the design more ergonomic and ultimately improve the user experience. The improve phase is an ongoing process; the team is constantly looking for ways to improve the website. The content in the information and news section has to be constantly updated to provide a good service to existing subscribers and also attract more traffic into the website. The weekly meetings with

the academic advisor have been complemented by continuous brainstorming and information gathering to improve the features of the information platform.

Control:

The control phase will also follow a continuous improvement ideology. There will be a contact form for the users to contact the team if they have suggestions on how to improve the website, or any questions that might help change and clarify any feature in the information platform. In the control phase, the team used and will continue to use the statistics and traffics and viewer clicks that WordPress provides to see which sections are most popular and also how the users navigate through the information platform. The popularity of the ads that will generate revenue will also be monitored to track progress and keep developing the information platform.

Methods

Since the team has created a website from a blank template using WordPress, the team has to make sure that the information is easy to access for the end user. This was first done by creating a design template on paper. By creating the design on paper it helped as a visual aid when creating the website on WordPress. This helped because it was a good way to get ideas down and then work from there, since it is hard to create a website if there is not a clear template. Having this design template on paper enabled the team get those ideas into a website. This consisted of creating the basic layout of the website, for example the home page and the different tabs.

After the website had been created there had to be a process of continuous improvement, making sure that when information is added, the website is still working. A lot of the time, when the the team updates the website, different buttons (control element that provides the user a simple way to trigger an event) are added or erased, these changes can affect the design of the website and can create bugs. When this happens the team needs to make sure those bugs are fixed or deleted in accordance to what is needed to make the website function. To make these changes one has to be familiar with how WordPress works and making the appropriate changes in the coding language they are using to make the website.

Another crucial step in the methods for the project is making sure that the website is user friendly. Nowadays there are many different designs for websites not all of them being the most appropriate one for the end user. When users enter the website it is sometimes hard to find the information that is trying to be shown or the message

being directed by the designers. In order to achieve the goal of having an ergonomic friendly design, our team had to refer back to information taught in IME 319 (Human Factors Engineering) and also consult different professors as to what would be the best user friendly design .It is hard to know exactly when one has achieved a perfect user friendly design because a lot of times it comes down to preference of the users. Some users might prefer “x” and some users might prefer “y”. For this reason websites have continuous improvements to achieve user friendly design that meets a common design goal for all users.

Results

Economic Analysis

For the economic analysis of the project and the website, the team first established that it was going to be nonprofit. There is a difference between not for profit which can by any activity like reading a book or creating a blog just to contact friends, but nonprofit refers to an organization that is not intended to make profit, but can create revenue and has expenses. The Carbon Neutral Platform will certainly generate profit because it is projected that the revenue from the advertisement and the companies that want to be featured in the website will be greater than the labor and maintenance cost of the website. The profit will be directed towards funding for student projects related to sustainability that have similar goals and objectives as this project. The funding for the projects will depend on the success of the website. If the website continues to grow and so does the profit, the team will look for further options to give scholarships to students that are interested in helping the environment and want to make a difference in this world to protect our natural resources.

The time period used in the cash flow analysis is 12 months in order to increase the accuracy by forecasting in the near future. There was a process of gathering information about the revenue from advertisement that wordpress.org can provide depending on the size and location of the advertisement in the website. There was also information gathering on the performance of websites on WordPress during the first 12 months trying to predict the possible clicks per month that could be received considering the growth and trend of the website. The team also got familiar to the performance history of websites concerned with the environment, sustainable practices or a topic related to carbon neutrality.

The following costs were used for the calculation of the cash flow analysis:

- Setup the domain name = $18 in month 0
- Domain Maintenance = $12 starting month 0 and ending month 12
- WordPress Monthly Cost = $12 starting month 0 and ending month 12
- The labor cost/hr = $20

The following costs were used for the calculation of the cash flow analysis:

- Revenue per click on advertisement = $1
- Charge for adding product or service = $10/month for the first 5 months
- Charge for adding product or service = $25/month for months 6-12

There were three different scenarios calculated and analyzed in the cash flow analysis.

Pessimistic scenario

The labor hours for the month 0 are the labor hours that the team has already spent on the website creation. It is estimated that for month 1 the labor hours will decrease significantly as just some small changes are going to be needed in the website. For the remaining months, the labor hours needed will be stable at 50 hours per month because of the work needed will be to update the latest news section and revise the latest requests to add a product or service to the website. As will as continue to do research on the carbon neutral topic and be able to give users the best information available.

The following table has the values for the “demand” used for the pessimistic scenario to calculate the cost from labor and the revenue from advertisement as well as products and services added to the website.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Labor Hours	200	70	50	50	50	50	50	50	50	50	50	50	50
Monthly Clicks from advertisiement	0	15	30	30	35	35	35	40	40	60	60	60	70
Products added to wesbite monthly	0	0	0	4	4	6	10	10	12	12	12	12	16
Services added to website monthly	0	0	0	2	2	3	5	10	11	12	11	13	10

Table 1: Pessimistic Scenario Projected Demand

The following table includes all the calculations from costs and revenue based on the projected “demand” for the pessimistic scenario. There was also a $200 cost added on week six for marketing and website exposure. This was added at the middle of the timespan for the cash flow to increase the number of users that visit the website and get more exposure to companies that have carbon neutral products.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Costs													
Set-up domain	-$18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Wordpress monthly cost	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12
Labor Cost	-$4,000	-$1,400	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000
Marketing and website exposure	-$100	$0		$0	$0	$0	-$200	$0	$0	$0	$0	$0	$0
Revenue													
Advertisement	$0	$15	$30	$30	$35	$35	$35	$40	$40	$60	$60	$60	$70
Service added to website	0	0	0	20	40	70	195	445	720	1020	1295	1620	1870
Product added to webstie	0	0	0	40	80	140	390	640	940	1240	1540	1840	2240
Cash Flow	-$4,130	-$1,397	-$982	-$922	-$857	-$767	-$592	$113	$688	$1,308	$1,883	$2,508	$3,168

Table 2: Pessimistic Scenarios Cash Flow Table

The cash flow has a value of **$21** after the end of the 12 month period. It is not a very large profit made on the project, but it is important to consider that it is enough to keep the project going. Although there will not be any profit left to give back to students and funding for other environmentally friendly projects, it is a viable project because the cost can certainly be covered in the pessimistic scenario.

The following bar chart is a visual representation of the cash flow analysis.

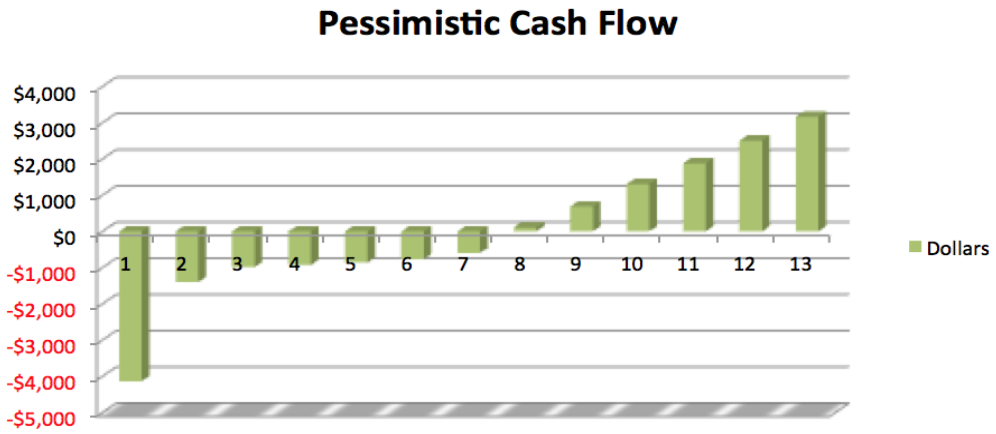

Figure 1: Pessimistic Scenario Cash Flow

Optimistic Scenario

For the optimistic scenario, the labor hours for month 0 are the labor hours that the team already spent in creating the website. The labor hours required will increase after month 5 which is the midpoint of the time period, where there is a projected increase in users and subscriptions for the website. The following table represents the "demand" for labor hours as well as the projected monthly clicks from advertisement and the projected number products/services added each month.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Labor Hours	200	70	50	50	50	60	60	60	70	70	80	80	80
Monthly Clicks from advertisiement	0	20	30	35	35	50	60	60	80	80	80	100	100
Products added to wesbite monthly	0	0	0	4	4	8	11	15	18	23	23	25	25
Services added to website monthly	0	0	0	2	2	7	7	8	8	12	14	16	20

Table 3: Optimistic Scenario Projected Demand

The following table for the cash flow includes all the calculations from the cost and revenue from the projected “demand” based on the data from similar websites and wordpress.org startups. There is a website marketing and exposure cost added to the optimistic scenario and totals $1,100. This is a cost for promoting the website and making sure companies and potential advertisers can get to know the information platform. The $1,100 was invested the following way: $100 in month 1, $300 in month 5 and month 8, and $200 in month 9 and month 11.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Costs													
Set-up domain	-$18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Wordpress monthly cost	$0	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12
Labor Cost	-$4,000	-$1,400	-$1,000	-$1,000	-$1,000	-$1,200	-$1,200	-$1,200	-$1,400	-$1,400	-$1,600	-$1,600	-$1,600
Marketing and website exposure	$0	-$100	$0	$0	$0	-$300	$0	$0	-$300	-$200	$0	-$200	$0
Revenue													
Advertisement	$0	$20	$30	$35	$35	$50	$60	$60	$80	$80	$80	$100	$100
Service added to website	0	0	0	20	40	110	285	485	685	985	1335	1735	2235
Product added to webstie	0	0	0	40	80	160	435	810	1260	1835	2410	3035	3660
Cash Flow	-$4,018	-$1,492	-$982	-$917	-$857	-$1,192	-$432	$143	$313	$1,288	$2,213	$3,058	$4,383

Table 4: Optimistic Scenario Cash Flow Table

The cash flow has a value of **$1508** at the end of the 12 month period. In the optimistic scenario, it was projected that by the 12 month of the website the revenue will be **$4,283** dollars from the services and products added to the website. The optimistic scenario would provide the opportunity to cover the costs and also have $1500 available for projects and research to help the environment and look for opportunities to improve the world for future generations.

The following is a visual representation of the optimistic scenario cash flow.

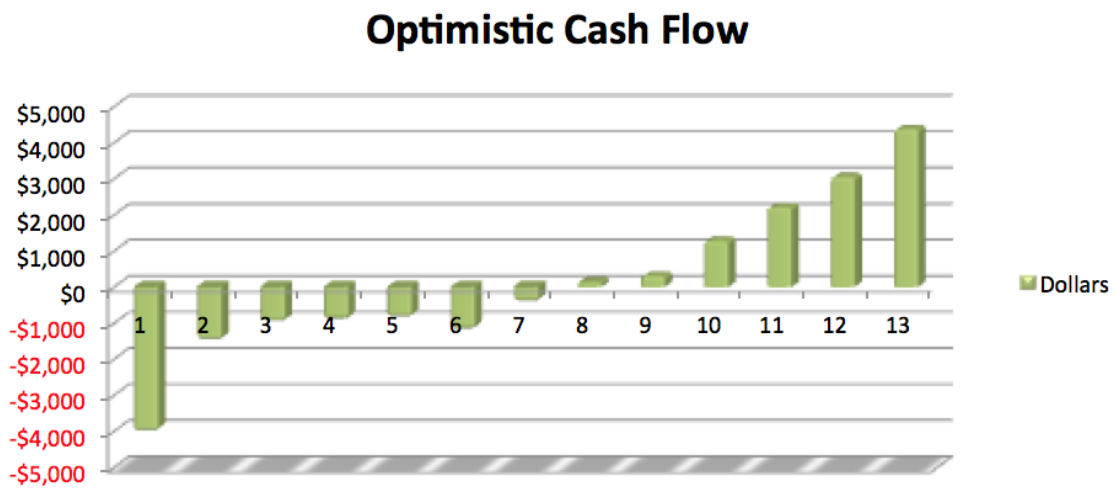

Figure 2: Optimistic Scenario Cash Flow

Most Likely scenario

The most likely scenario was developed using the data and performance of startup websites in wordpress.org and also the success of environmentally friendly websites and the possible market size for carbon neutral products. The following “demand” prediction table for monthly clicks on advertisement and product/service additions was used to develop the most likely scenario cash flow.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Labor Hours	200	70	50	50	50	50	50	60	60	60	75	75	75
Monthly Clicks from advertisiement	0	20	30	35	35	50	60	60	80	80	80	100	100
Products added to wesbite monthly	0	0	0	4	4	9	11	15	15	14	16	18	20
Services added to website monthly	0	0	0	2	2	8	8	8	8	12	18	18	19

Table 5: Most likely Scenario Projected Demand

The cash flow for the most likely scenario was developed using the projected demand table to calculate the revenue and also the costs for the labor hours. The labor hours required increased with respect to the pessimistic scenario because it is assumed that as the website grows and gets more users and traffic, the hours required to give the users the latest news and updated content will increase. There was also a marketing and exposure cost added to the most likely scenario with a total of $1200 dollars divided equally in the 12 month period. The following tables detail each cost and revenue by month to calculate the cash flow.

	0	1	2	3	4	5	6	7	8	9	10	11	12
Costs													
Set-up domain	-$18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Wordpress monthly cost	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12	-$12
Labor Cost	-$4,000	-$1,400	-$1,000	-$1,000	-$1,000	-$1,000	-$1,000	-$1,200	-$1,200	-$1,200	-$1,500	-$1,500	-$1,500
Marketing and website exposure	$0	-$100	-$100	-$100	-$100	-$100	-$100	-$100	-$100	-$100	-$100	-$100	-$100
Revenue													
Advertisement	$0	$20	$30	$35	$35	$50	$60	$60	$80	$80	$80	$100	$100
Service added to website	0	0	0	20	40	120	320	520	720	1020	1470	1920	2395
Product added to webstie	0	0	0	40	80	140	415	790	1165	1515	1915	2365	2865
Cash Flow	-$4,030	-$1,492	-$1,082	-$1,017	-$957	-$802	-$317	$58	$653	$1,303	$1,853	$2,773	$3,748

Table 6: Most Likely Scenario Cash Flow Table

The cash flow has a value of **$691** dollars at the end of the 12 month period. It is projected that this cash flow will continue to increase after 12 months as the subscriptions continue to increase. The revenue is enough to cover the costs of the website which makes this platform a very viable project. The 691 dollar profit from the most likely scenario would be directed towards funding for student projects and future learning on sustainability.

The following is a visual representation of the most likely scenario cash flow.

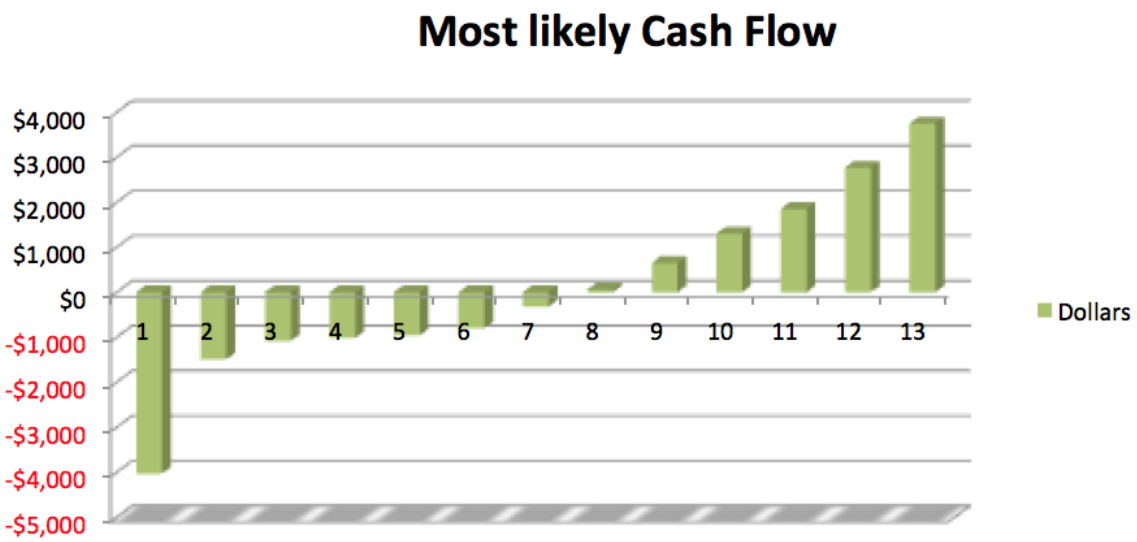

Figure 3: Most Likely Scenario Cash Flow

Economic Analysis summary

The three scenarios studied in the economic analysis suggest that the project is very economically feasible. Even the pessimistic scenario suggests that the project would not have negative numbers after the 12 month period. The goal of the project and the development of the website is not to make profit so for the team the economic aspect is not the most important. The economic analysis proved that in the worst case scenario the project can still be developed and meet the goal of ultimately increasing the quality of life of in the world today and of future generations through awareness, connection, and guidance in topics related to sustainability. The economic analysis also proved that if the website continues to grow, there will be a profit made at the end of each year, and the money can be used to continue to inspire and sponsor students and projects that have similar goals as the carbon neutral information platform.

Information Platform (website)

The team has been able to achieve the goal of creating a website; it has the domain of “www.carbonneutralplatform.com”. If someone goes to the website they will see the different tabs that have been created.

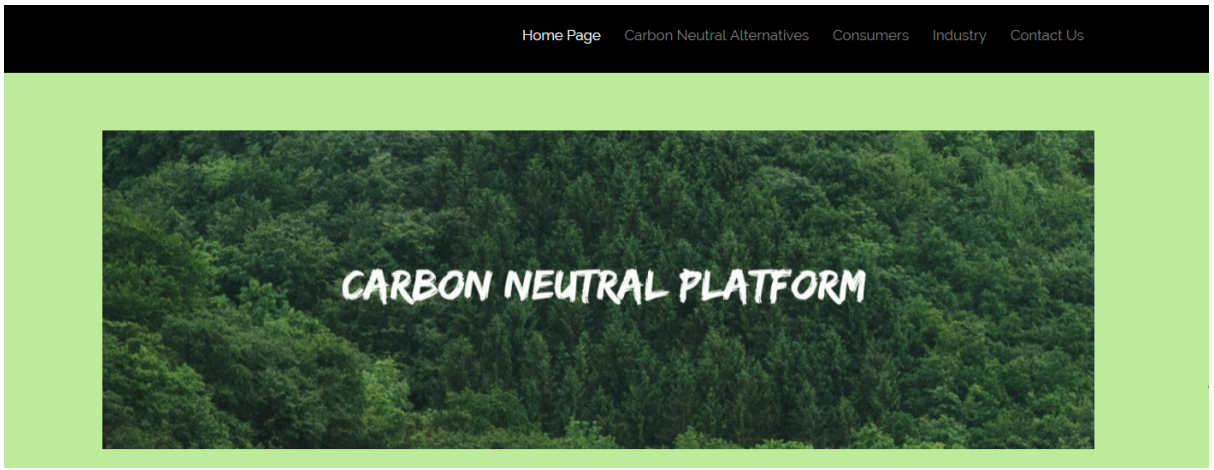

Figure 4: Main Page

As you can see, the team decided to have six different main tabs, those being:

- Home
- Carbon Neutral Alternatives
- Consumers
- Industry
- Information/ News
- Contact Us

These are the main tabs in the website, besides those there are additional tabs that supplement the main tabs. Some of those can be seen by having the cursor over the main tabs.

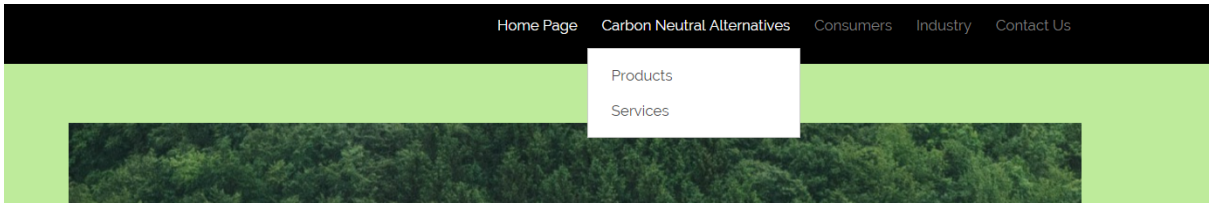

Figure 5: Sub Tabs

Those sub tabs are there to supplement the main tabs. For example the “Products” and “Services” tabs are part of the carbon neutral alternatives.

Home Page

This is going to be main page of the website where the users will be directed when they type the domain name of “www.carbonneutralplatform.com”. The goal here is to have a segment that is continuously updated that contains news around the world that are related to sustainability. There is section that will allow users to subscribe to the mailing news in order to be informed on general information on a monthly basis.

There is also general information at the bottom on what carbon neutrality is as well as how business can apply said information. The Home page also includes links that will direct the users to other tabs on the website, for example if they click “learn more” they will be directed to the information tab. To view the design of the home page, refer to Figure 6 & 7 in the appendix.

Carbon Neutral Alternatives

The purpose of this page is to connect consumers with products or services that are carbon neutral. With the research that has been done, many consumers want to find alternatives that are carbon neutral. The goal is to connect those consumers to the products or services available. There are currently no websites that offer carbon neutral products to consumers, or websites that inform consumers on what is available. In the future our team will add more and more products or services as companies provide the necessary information to show they have achieved the necessary steps for their products or services to be carbon neutral.

Products

This page will offer all the different products from the various companies that have taken the necessary steps to achieve carbon neutral products. The goal is to be available to offer products for consumers that will touch on all the main categories. For example to have products for: Health and Beauty, Clothing, House Goods etc. In the end the team wants to grow the list to give consumers the best options out in the market.

Services

This page will be very similar to the products page. As the website gets more and more companies to advertise their products it will help consumers in picking option that best meet their needs.

In both the products and service page there is a form for companies to access in order to submit their product or services for the website to advertise. Once the companies submit they desired product or service they would want the website to advertise the team will make sure that they are indeed products or services that have achieved carbon neutrality.

Customers

This page is intended for users that are looking at the website in the eyes of a customer. There are many different things being offered in this page which are the following:

- Environmental Projects
    - This section includes different projects that have been done in regards to carbon neutrality.
    - It gives customers different case studies to analyze to see what is being done around the world.
- Carbon Alternatives
    - This page connects customers to the option of purchasing products or services that are carbon neutral.
- Reduce Carbon Footprint
    - Here is a list of things individuals can do in order to reduce their carbon footprint.
    - Many of this things can be incorporated into their daily lives.
- Calculator
    - This calculator gives individuals the opportunity to analyze how much carbon emissions they have from their activities.
    - This will help individuals see how they can perform different activities and how this will help them reduce their carbon footprint.
    - Also in this link is the option to contribute to organizations that perform projects and they can donate money in order to offset their carbon footprint.
- Most Sustainable Companies
    - Will let customers know what companies have been rated as the most sustainable in the world.
    - This will help customers know what companies are taking the necessary means to becoming more sustainable and can buy products or services accordingly.

Refer to figure 8 in appendix to view customers page.

Industry

This page is intended for companies that are interested about learning benefits of having their business becoming more sustainable. Also connecting those to other companies that will help them take the necessary steps to making their business more sustainable. These are the different focuses in the industry tab:

- Case Studies

    - This is a link to many case studies done on companies that underwent projects dealing with performing carbon neutral projects.
    - One can see the different results, testimonials, and other impacts those projects had on the companies.
- Projects
    - This part of the page connects companies that are interested in starting a carbon offset project with such projects.
    - There are many different types of projects available for companies to do. From investing in projects outside their company in order to reduce the carbon footprint as well as projects that will have an impact in the company and will make their methods more carbon friendly.
- Dow Jones Sustainability Index
    - This gives a list of Dow Jones companies and rates them on how sustainable they are.
    - This is important because nowadays companies are realizing that having a sustainable model will let consumers know that while they make a certain good they make it with concern to the environment.
- Calculator
    - This calculator gives companies the opportunity to analyze their carbon emissions output.
    - It also gives them the opportunity offset those emissions by contacting with companies that specialize in that field.

Information/ News

This page will serve as an information platform for both customers and industry. There will be continuous updates on news around the world relating to carbon neutral information, as well as sustainability. It ranges from important breakthroughs in technology, to laws that are being passed around the world to reduce carbon emissions. This will be targeted to everyone that wants to know more information on carbon neutrality and impacts that carbon emissions have on their daily activities.

One of the goals of the project is to have a lot of users coming into the website in to discover relevant news are around the world in environmentally friendly topics. In order to achieve this goal the team was to find different options to gather news. Some of these options will be to team up with research companies or companies that focus on this field. What the team will try to do is get abstracts of these articles promote them in the website and then link them to the original source. Another

option is for users to subscribe to the mailing list provided and once a partnership is established with an information source to let them view the articles.

There are also going to be videos that are informative and give users and different source of news. Some can be on conferences that are touching on topic at hand, to different documentaries related to the environment.

Conclusion

The problem that the team wanted to address before the project started was that there is currently no website that helps guide customers that want to find products or services from companies that are carbon neutral. For example, an individual that wants to buy flavored drinks and is willing to pay more for that drink as long as the company that makes that drink has gone through the necessary steps to offset the amount of carbon emissions it takes to get that drink into the hands of the consumer. Many consumers out there are conscious about the impact of carbon emissions on planet earth and want to change their lifestyle but do not know how to go about it. This is where the idea for the project started.

The team decided to create a website with several goals in mind at the beginning of the project. After creating the website the team has been able to achieve many of the goals set at the beginning of the project Objectives achieved for the information platform where the following:

- Section dedicated to carbon neutral alternatives where products or services will be advertised for companies. The goal of having consumers access this page to refer alternatives they want to buy/ replace current alternatives they use that do not meet standards of being carbon neutral.
- Section for consumers that gives them tips in reducing their carbon footprint, calculator to measure their current daily emissions.
- Section for industries to view benefits of making changes in their business to becoming more sustainable.
    - Connecting business with companies that focus in helping companies start projects that will help those companies offset carbon emissions from their business.
- Section to informing users on the topic of carbon neutral, sustainability and many other related topics.

By the end of the project the team has been able to create an information platform that will raise awareness on the topic at hand as well as connect consumers to different products and services, among other features.

Having set up clear goals and guidelines were key to finishing the project in time. In order to come up with a solution using the DMAIC steps was very helpful. In this project, like in many others there is always the opportunity for continuous improvement. This is something that the team has taken into consideration and will continue to do as changes are being made to the website.

Project Reflection

By doing this project the team found out how many of the topics and lessons learned throughout the IME careers have been useful. Different topics learned from IME 312, IME 430, IME 303, IME 301, IME 410 and many other classes were used in order to perform and finish the project. The team also learned that after much organization, concentration and hard work done, in the end there was a final tangible project to be considered a successful result.

For the future it would be good to get inputs from different teachers when performing the project. At the beginning of the project the team started out with a an idea but was heading in a different way from creating a website, but after guidance from the team's advisor it was able to head in a better direction, one that would have more lasting impact. If the team would have approached many more different teachers they could have given them more guidance and possible information to make the project have a bigger impact.

Another thing that could have been useful is teaming up with other students that have knowledge in different fields. Creating the website was a lot of work, the knowledge the team had was limited to IME 312. In order to create the website we had to watch a lot of videos and tutorials in order to get the website running, add content and fix bugs. Having someone that had knowledge on creating websites would have helped especially when it came down to troubleshooting.

Some recommendations for future students are when trying to find solutions make sure that you are not trying to reinvent the wheel. There are many resources out there that if one researches could aid in facilitating progress on their project.

Appendix

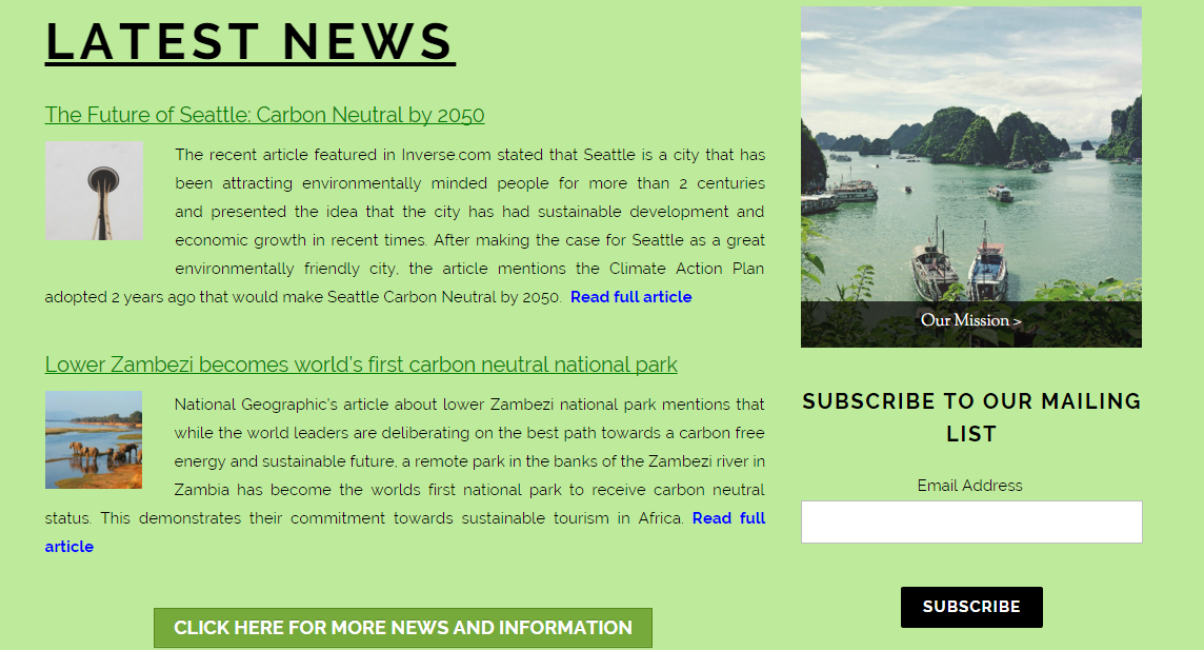

Figure 6: Home Page

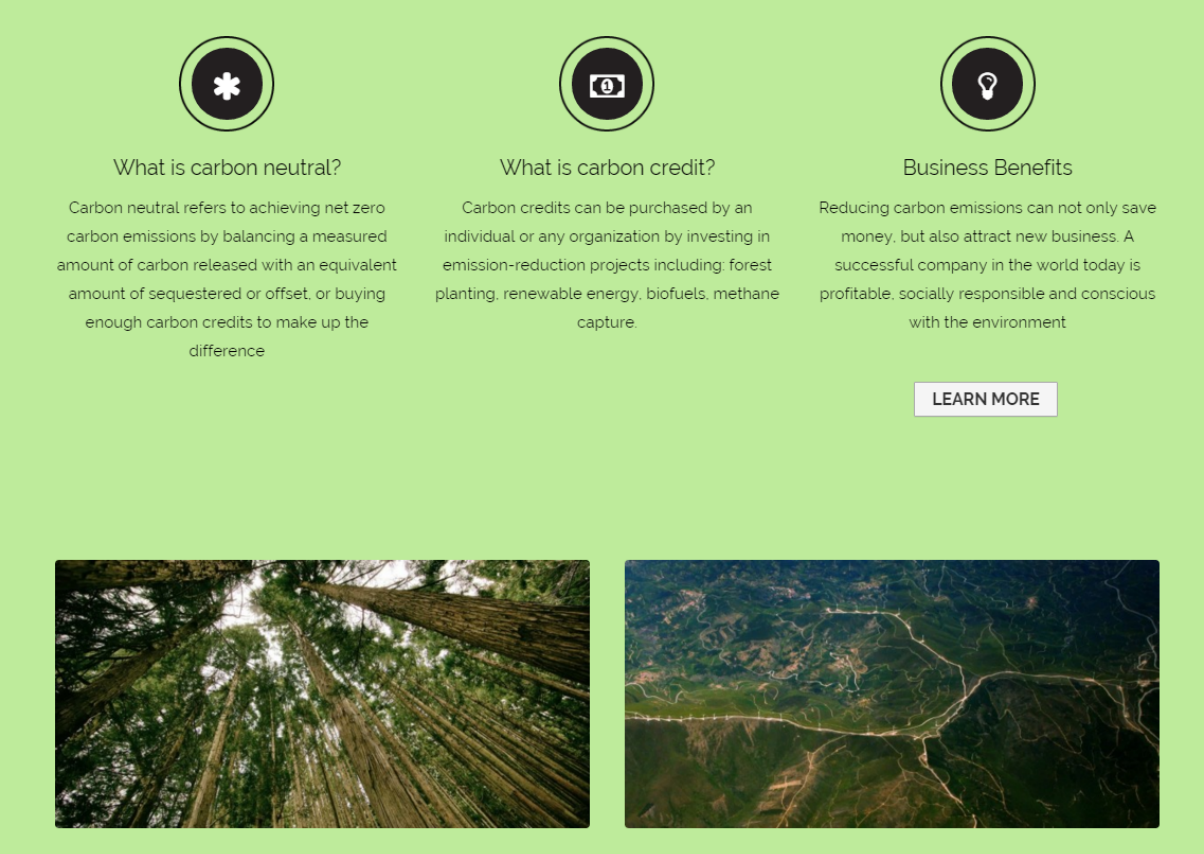

Figure 7: Home Page

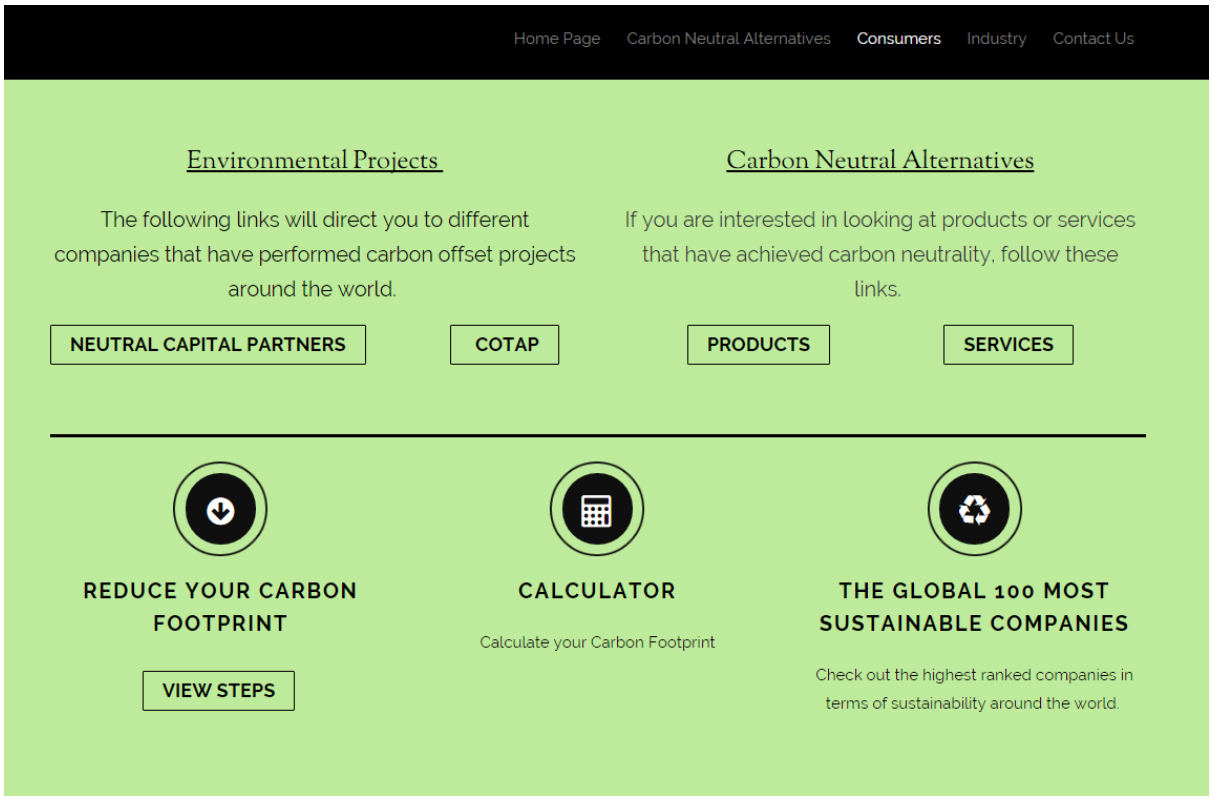

Figure 8: Consumers Page

Website outline

1. Home Page
    a. About Us
    b. Home
        i. Carbon Neutral Platform Photo
        ii. Recent News
            1. link FOR MORE NEWS
        iii. Stay informed
            1. Subscribe page to receive monthly email and information
        iv. Quote
        v. 3 links for more information
        vi. 2 nature photos
2. Carbon Neutral Alternatives
    a. Information on carbon neutral alternatives
    b. Links for Products, Services
        i. Products
            1. Household
            2. Food
            3. Travel'
            4. Form to ADD PRODUCT
            5. Product Reviews/ comments
        ii. Services
            1. Shipping
            2. Travel
            3. Form to ADD SERVICE
            4. Service reviews/ comments
3. Industry
    a. Sustainable projects for your company
        i. Description del project
        ii. Link
    b. View customer trends
    c. Benefits of becoming carbon neutral for your company
        i. Save money
        ii. New market
4. Customers
    a. Carbon neutral alternatives
        i. If you are interested in carbon neutral alternatives click here
    b. Sustainable companies
    c. Environmentally project click here
    d. Carbon Emission calculator
    e. Easy everyday steps to reduce your carbon footprint
        i. (If you drive x reduce z)
        ii. Turn of lights
5. Information News
    a. General Information
    b. News
    c. Photos

Figure 9: Website Outline

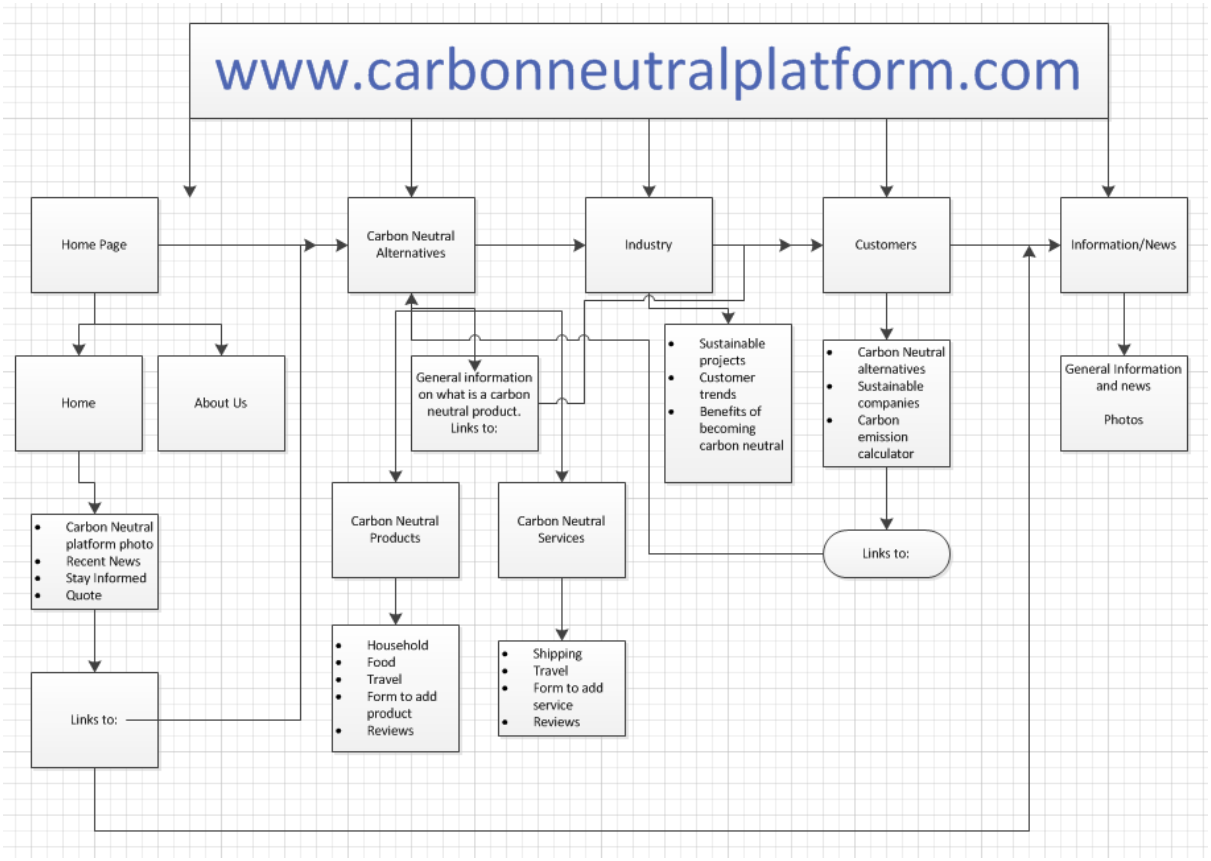

Figure 10: Website Flowchart

Works Cited

1. "The Meaning of Carbon Neutrality." Go-Green. N.p., n.d. Web. 1 Nov. 2015.

2. "IPCC Third Assessment Report - Climate Change 2001." IPCC. N.p., n.d. Web. 03 Nov. 2015.
3. "THE HUMAN FOOT PRINT - JOURNEY OF A LIFE TIME." Green Contributor. N.p., n.d. Web. 1 Nov. 2015.

4. "Union of Concerned Scientists." Choice Reviews Online 37.07 (2000): n. pag. Union of Concerned Scientists. Web. 1 Nov. 2015.

5. "Coal Utilization Technologies." Home. N.p., n.d. Web. 03 Nov. 2015.

6. Slaper, Timothy F., PhD., and Tanya J. Hall. "The Triple Bottom Line: What is it and how does it Work?" Indiana Business Review 86.1 (2011): 4-8. ProQuest. 15 Nov. 2015 .

7. "New Climate Change Study Promotes Progressive Strategy to Reduce CO2 Emissions while Reducing Payroll Taxes on Average Americans." PR Newswire Jun 23 2008 ProQuest. 15 Nov. 2015 .

8. Mathieson, S. A. "Technology: It's no Longer Emission Impossible: Making Your Company More Environmentally Friendly Needn't be a Costly Chore. Reducing Carbon Emissions can Not Only Save Money, but also Attract New Business, Says SA Mathieson." *The Guardian*: 1. Apr 28 2006. *ProQuest.* Web. 15 Nov. 2015 .

9.Graham-Rowe, Duncan. "20 Ways YOU can Cut Your Carbon Footprint ; AFTER THE HOTTEST JANUARY FOR 90 YEARS, HOW TO REDUCE THE GLOBAL IMPACT OF YOUR CO2 EMISSIONS." *Evening Standard*: 12. Feb 01 2007. *ProQuest.* Web. 15 Nov. 2015 .

10. Gardner, Karen. "Residents Urged to Reduce CO2 Emissions." *McClatchy - Tribune Business News*Nov 02 2007. *ProQuest.* Web. 15 Nov. 2015 .

11. Webb, Tobias. "Climate Change: Challenging Business: Footprinting: A Step in the Right Direction: Interest in Carbon Labelling has Grown since Last Month's Energy White Paper Told Large Companies they Will have to Calculate and Reduce their CO2 Emissions. Tobias Webb Looks at an Inexact Science." *The Guardian*: 2. Jun 27 2007. *ProQuest.* Web. 15 Nov. 2015 .

12. Bumpus, Adam G., and Diana M. Liverman. "Accumulation by Decarbonization and the Governance of Carbon Offsets." *Economic Geography* 84.2 (2008): 127-55. *ProQuest.* Web. 15 Nov. 2015.

13. Gurjar, B., Ojha, C., Surampalli, R., Zhang, T., and Walvekar, P. (2015) Carbon Capture and Storage: An Overview. Carbon Capture and Storage: pp. 7-35.